640 GHz Heterodyne Polarimeter, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

This proposal is responsive to NASA SBIR Subtopic S1.02: Microwave Technologies for Remote Sensing, specifically the interest in the development of a 640 GHz Heterodyne Polarimeter with I, Q, U Channels. Suitably compact, light-weight and power efficient heterodyne instruments are required to enable polarimetric measurements for microphysical parameterization of ice clouds applicable to NASA's planned Aerosol, Cloud and Ecosystems (ACE) mission. VDI will develop and demonstrate a compact heterodyne receiver technology that achieves the polarimetric capability required for ACE and other atmospheric remote sensing instruments throughout the frequency range from 100 GHz to about 1 THz. Through the Phase 1 effort, VDI will demonstrate the feasibility of achieving the 640 GHz polarimetric receiver capability required by NASA. This effort will include the development and characterization of a 640 GHz orthomode transducer (OMT), the demonstration of a 640 GHz low-noise amplifier, and the assembly and testing of a complete polarimetric receiver. Although the Phase 1 prototype will use discrete components (OMT, LNA, mixer, and multipliers); all of these components will be designed for full integration in Phase 2.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: For NASA, a primary application is the development of a suitable heterodyne polarimeter for the planned Aerosol, Cloud and Ecosystems (ACE) mission. The integrated polarimetric receiver module that will be developed through the successful completion of this proposed SBIR project will meet all of the performance requirements of ACE. These include low volume and mass, reduced power dissipation, state of the art sensitivity and broad available IF bandwidth with excellent frequency resolution. Additional NASA applications include all missions that require

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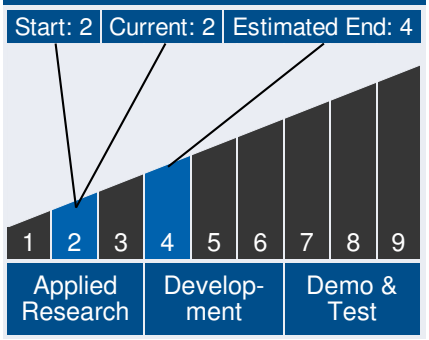
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

high frequency resolution polarimetric measurements in the range from ~100 - 1,000 GHz; for example studies of the Earth's atmosphere and other solar system bodies, and especially Cube Sat missions.

To the commercial space industry:

Potential Non-NASA Commercial Applications: One of the primary impediments to future scientific and commercial applications of the terahertz spectrum is the lack of compact, reliable and cost efficient receiver systems. Through this proposal and follow-on Phase 3 research, VDI will develop a new product line of highly integrated receiver systems throughout the frequency band from about 100 GHz to over 1 THz. The basic arguments for more highly integrated receiver systems include reduced size and weight, greater reliability and lower production costs. Improved performance and reliability are also possible through integration. Potential applications include a wide array of scientific investigations as well as a wealth of possible commercial and industrial applications; including imaging systems, chemical sensors, plasma diagnostics and industrial processing control.

Management Team *(cont.)*

Principal Investigator:

- Jeffrey Hesler

Technology Areas

Primary Technology Area:
Science Instruments, Observatories, and Sensor Systems (TA 8)
└ Remote Sensing Instruments and Sensors (TA 8.1)
  └ Microwave, Millimeter-, and Submillimeter-Waves (TA 8.1.4)

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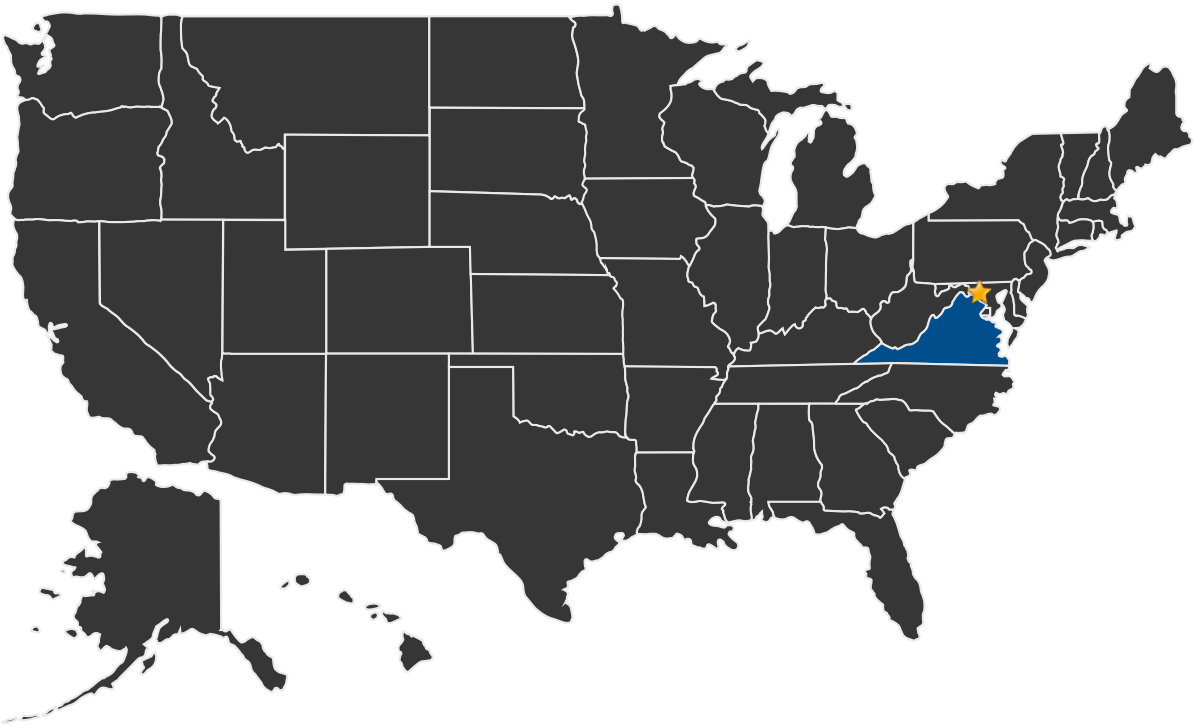
U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Goddard Space Flight Center

Other Organizations Performing Work:

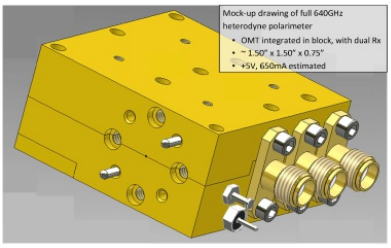
- Virginia Diodes, Inc. (Charlottesville, VA)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23531)

IMAGE GALLERY



640 GHz Heterodyne Polarimeter, Phase I

DETAILS FOR TECHNOLOGY 1

Technology Title

640 GHz Heterodyne Polarimeter, Phase I

Potential Applications

For NASA, a primary application is the development of a suitable heterodyne polarimeter for the planned Aerosol, Cloud and Ecosystems (ACE) mission. The integrated polarimetric receiver module that will be developed through the successful completion of this proposed SBIR project will meet all of the performance requirements of ACE. These include low volume and mass, reduced power dissipation, state of the art sensitivity and broad available IF bandwidth with excellent frequency resolution. Additional NASA applications include all missions that require high frequency resolution polarimetric measurements in the range from ~100 - 1,000 GHz; for example studies of the Earth's atmosphere and other solar system bodies, and especially Cube Sat missions.